CRYPTOSPORIDIOSIS

✓DISEASE AND EPIDEMIOLOGY

Clinical Description:

The most common symptom of cryptosporidiosis is profuse and watery diarrhea. Other signs and symptoms include weight loss, stomach cramps, nausea, vomiting, and low-grade fever. In immunocompetent people (including children), the illness is self-limited, lasting 1 to 20 days (average 10 days). However, in immunodeficient patients, especially those with AIDS, chronic infection may cause severe diarrhea, malnutrition, dehydration and possibly death. Although infection is usually limited to the gastrointestinal tract, disseminated infection has occurred in immunodeficient patients. Asymptomatic infections are common and serve as a source of infection for others.

Causative Agent:

Cryptosporidiosis is a parasitic infection caused by the protozoan *Cryptosporidium parvum*. Infectious oocysts (the state in the parasite's life cycle when the organism is surrounded by a protective shell) of *C. parvum* are small. They can survive for months in soil under cool dark conditions, for up to a year in low-turbidity water, and are more resistant to chemical agents (including chlorine) than the majority of protozoa. Infectivity appears to cease when oocysts are frozen, freeze-dried, boiled, or heated to 140 or above for 5 to 10 minutes.

Differential Diagnosis:

The differential diagnosis for *Cryptosporidium parvum* includes *Giardia, Isospora,* microsporidia, *Cyclospora, Clostridium difficile, Salmonella, Shigella, Campylobacter, Mycobacterium avium* complex, cytomegalovirus, rotavirus, norovirus, and adenovirus.

Laboratory identification:

Diagnosis is generally made by the identification of oocysts in fecal smears. Organisms can also be identified in intestinal biopsy tissue. In addition, new and more sensitive enzyme immunoassay (EIA) tests have recently become available. Since the infectious oocysts are excreted from the body intermittently, at least two stool samples should be examined before the test can be considered negative.

> **UPHL:** The Utah Public Health Laboratory tests for *Cryptosporidium* using an ELISA test.

Treatment:

A 3-day course of nitazoxanide oral suspension has been licensed for treatment of children. In immunocompromised persons with cryptosporidiosis, oral administration of Human Immune Globulin or bovine colostrum has been beneficial.

Case fatality:

The disease can be prolonged and life-threatening in severely immunocompromised persons.

Reservoir:
Humans, cattle, and domestic animals are reservoirs.

Transmission:
In order for infection to occur, the susceptible host must ingest water or other materials contaminated with the *Cryptosporidium* oocysts. As such, important routes of transmission include person-to-person, fecal-oral, animal-to-person, and waterborne. Infected animals and people excrete large numbers of oocysts in stool. The infectious dose is not certain, but it is probably low. Oocysts are relatively hardy and can survive in the environment for weeks or months. They are resistant to concentrations of chlorine and other disinfectants commonly used for drinking water treatment. They can be killed by heat or removed by filtration. The most common mode of transmission is from person-to-person. Persons become infected by hand-to-mouth transfer of oocysts from the feces of an infected individual, especially in institutions and daycare centers. Person-to-person transmission can also occur through certain types of sexual contact (e.g., oral-anal contact).

Susceptibility:
Anyone can get cryptosporidiosis. Groups at increased risk for infection include animal handlers, travelers, homosexual men, and close personal contacts of infected individuals (families, daycare and healthcare workers). Scientists have not yet established whether immunity is conferred by infection, though second infections have not been reported. Peak infection rates occur in the young and decrease progressively with age.

Incubation period:
Symptoms appear 2 to 14 days after exposure (average 7 days).

Period of communicability:
The disease is communicable for as long as the infected person excretes *Cryptosporidium* oocysts. Oocysts typically appear in the stool when symptoms first begin and continue to be excreted for several weeks after symptoms resolve. Oocysts may remain infective outside the body for 2–6 months in a moist environment.

Epidemiology:
Cryptosporidiosis has a worldwide distribution. In developed countries, the prevalence of infection ranges from <1–4.5% of individuals surveyed by stool examination. The prevalence is significantly higher in developing regions of the world. Cryptosporidiosis is still among the most common causes of persistent diarrhea in patients with AIDS in the US, but it has become less of a problem since the introduction of anti-retroviral therapy. Large outbreaks traced to contaminated drinking water have been reported, including an outbreak in Milwaukee in 1993 that reportedly affected 400,000 people. Localized outbreaks have been reported in daycare centers and have been associated with public drinking water, contaminated swimming pools, lakes and ponds, and with drinking unpasteurized cider made from apples contaminated with cow manure. It is estimated that

50% of dairy calves shed oocysts and that the parasite is present on more than 90% of dairy farms. Less than 20 infections with *Cryptosporidium* are identified in Utah each year.

✓PUBLIC HEALTH CONTROL MEASURES

Public health responsibility:

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention
- Identify clusters or outbreaks of this disease and determine the source.
- Identify cases and sources to prevent further transmission.

Prevention:

Personal Preventive Measures/Education

To avoid exposure, recommend that individuals:

- Always wash their hands thoroughly with soap and water before eating or preparing food, after using the toilet, after changing diapers, and after contact with animals, especially cattle.
- Wash their own hands as well as the child's hands after changing diapers dispose of diapers in a closed-lid garbage can.
- Wash their hands thoroughly and frequently when ill with diarrhea or when caring for someone with diarrhea. Hands should be scrubbed for at least 15–20 seconds after cleaning the bathroom, after using the toilet or helping someone use the toilet, after changing diapers, before handling food, and before eating.
- Avoid drinking raw milk, other unpasteurized dairy products, or unpasteurized apple cider.
- Avoid swallowing recreational water.
- Avoid swallowing pool or bath water, chlorination does not eliminate the parasite.
- Avoid swimming while ill with diarrhea and for at least 2 weeks after diarrhea.
- Avoid drinking unboiled water while traveling in developing countries or when the water quality is unknown. Bringing water to a full, rolling boil for three minutes is sufficient to kill *Cryptosporidium*.
- Adhere to local advisories to boil water.

Discuss transmission risks that may result from oral-anal sexual contact. Latex barrier protection (e.g., dental dam) may prevent the spread of *Cryptosporidium* to a case's sexual partners and may prevent exposure to and transmission of other fecal-oral pathogens.

Recommendations for the Immunocompromised

The risk for acquiring this infection during a *non-outbreak* setting is uncertain and current data are inadequate to make recommendations regarding drinking tap water under normal conditions. Severity of illness is correlated with the level of an individual's immunosuppression. However, immunodeficient people may wish to consider independent actions which may reduce the risk of waterborne *Cryptosporidiosis*:

- For all water consumption purposes, boil water at least three minutes before using (for elevations above 8,500 feet, boil for five minutes). This includes water used for brushing teeth, making ice cubes, washing food, etc. As an alternative to boiling water, some commercially available home water filtration units are considered effective against *Cryptosporidium.* While using bottled water might appear as an alternative, it is not routinely tested for *Cryptosporidium* and caution should be exercised when selecting a product. Contact the bottler for details on processing. (The decision to implement the preceding suggestions should be made in conjunction with a health care provider).
- When in restaurants or other public facilities, avoid tap water, ice cubes and any other beverage that is not canned or bottled.
- Make sure that eating and cooking materials washed in tap water are thoroughly dry before they are used.
- Avoid swallowing pool or bath water, chlorination does not eliminate the parasite.
- Avoid fecal contact.
- Consider the use of a home water filtration system with a very fine filter (absolute pore size of one micron or smaller). Such filters include: reverse-osmosis filters, filters labeled as "absolute" one micron filters, and those labeled as meeting National Sanitation Foundation (NSF) standard #53 for cyst removal.

Chemoprophylaxis:

None.

Vaccine:

None.

Isolation and quarantine requirements:

Isolation: Food handlers with cryptosporidiosis must be excluded from work until diarrhea has resolved. Persons diagnosed with cryptosporidiosis should not use recreational waters for 2 weeks after symptoms resolve.

NOTE: A food handler is any person directly preparing or handling food. This can include a patient care or childcare provider.

Hospital: Standard and contact precautions.

Quarantine: Contacts who have diarrhea and are food handling facility employees shall be considered the same as a case and shall be handled in the same fashion. No restrictions otherwise.

NOTE: In certain circumstances, cases, ill contacts, and/or asymptomatic contacts who are food handlers may be required to have negative stool samples prior to returning to work. The local health department will decide which cases and/or contacts will need negative stool samples prior to returning to work and whether 1 or 2 negative samples is necessary. If a case or contact has been treated with an antimicrobial agent, the stool specimen should not be collected until at least 48 hours after cessation of therapy. If 2 negative stool samples are determined to be necessary they should be taken at least 24 hours apart.

✓CASE INVESTIGATION

Reporting:

All cases of cryptosporidiosis should be reported to public health.

Case definition:

Cryptosporidiosis (1998)

Clinical description

An illness caused by the protozoan *Cryptosporidium parvum* and characterized by diarrhea, abdominal cramps, loss of appetite, low-grade fever, nausea, and vomiting. Infected persons may be asymptomatic. The disease can be prolonged and life-threatening in severely immunocompromised persons.

Laboratory criteria for diagnosis

Laboratory-confirmed cryptosporidiosis shall be defined as the detection – in symptomatic or asymptomatic persons – of *Cryptosporidium*:

- Oocysts in stool by microscopic examination, **or**
- In intestinal fluid or small-bowel biopsy specimens, **or**
- Oocyst or sporozoite antigens by immunodiagnostic methods, e.g., ELISA, **or**
- By PCR techniques when routinely available, **or**
- Demonstration of reproductive stages in tissue preparations.

Case classification

Confirmed, symptomatic: a laboratory-confirmed case associated with one of the symptoms described above.

Confirmed, asymptomatic: laboratory-confirmed case associated with none of the above symptoms.

Case Investigation Process:

- Food handlers should be excluded from work until diarrhea has resolved. Negative stool specimens may also be required.

Outbreaks:

CDC defines a food-borne outbreak as, “an incident in which two or more persons experience a similar illness resulting from the ingestion of a common food”. In order to confirm an outbreak of cryptosporidiosis, there must be at least 2 ill persons and detection of the *Cryptosporidium* organism or antigen in stool or small-bowel biopsy or the demonstration of toxin in epidemiologically implicated food. In waterborne outbreaks attributable to contaminated drinking water, advisories to boil water may be issued to prevent cases until appropriate water treatment is restored. *Cryptosporidium* has become one of the most common causes of waterborne disease. Because the parasite is chlorine-resistant and can survive for days in pools, chlorinated pools do not protect against transmission.

Identification of case contacts and management:

Daycare

Since cryptosporidiosis may be transmitted from person to person through fecal-oral transmission, it is important to follow up on cases of cryptosporidiosis in a daycare setting carefully.

- Children with *Cryptosporidium* who have diarrhea should be excluded until their diarrhea is resolved.
- Children with *Cryptosporidium* who have no diarrhea and are not otherwise ill may be excluded or may remain in the program, if special precautions are taken.
- Since most staff in childcare programs are food handlers, those with *Cryptosporidium* in their stools (symptomatic or not) can remain on site but must not prepare food or feed children until their diarrhea has resolved. Negative stool specimens may be required.

School

Since cryptosporidiosis may be transmitted from person-to-person through fecal-oral transmission, it is important to investigate cases of cryptosporidiosis in a school setting carefully.

- Students or staff with cryptosporidiosis who have diarrhea should be excluded until their diarrhea is gone.
- Students or staff with cryptosporidiosis who do not handle food, have no diarrhea or mild diarrhea, and are not otherwise sick may remain in school at the discretion of school administrators if special precautions are taken.
- Students or staff who handle food and have cryptosporidiosis infection must not prepare food until their diarrhea is gone. Negative stool specimens may be required.

Community Residential Programs

Actions taken in response to a case of cryptosporidiosis in a community residential program will depend on the type of program and the level of functioning of the residents.

In long-term care facilities, residents with cryptosporidiosis should be placed on standard (including enteric) precautions until their symptoms subside. Staff members who provide direct patient care (e.g., feed patients, give mouth or denture care, or give medications) are considered food handlers and should be treated as such. In addition, staff members with cryptosporidiosis who are not food handlers should not work until their diarrhea is gone.

In residential facilities for the developmentally disabled, staff and clients with cryptosporidiosis must refrain from handling or preparing food for other residents until their diarrhea has subsided. Negative stool specimens may be required. In addition, staff members with *Cryptosporidium* infection who are not food handlers should consider not working until their diarrhea is resolved.

✓REFERENCES

Centers for Disease Control, Case Definitions for Infectious Conditions Under Public Health Surveillance. MMWR 46 (RR-10), 1997.l

Control of Communicable Diseases Manual (18th Edition), Heymann, D.L., Ed; 2004.

Red Book: 2003 Report of the Committee on Infectious Diseases (26th Edition), Larry K. Pickering MD, Ed; 2003.

Principles and Practice of Infectious Disease (6th Edition), Gerald L. Mandell, John E. Bennett, and Raphael Dolin Eds; 2005.

Massachusetts Department of Public Health, Guide to Surveillance, Reporting and Control, 2006.

Food and Drug Administration. The Bad Bug Book.
http://vm.cfsan.fda.gov/~mow/intro.html